

10. Knowledge Management, Training and Education

Highlight

NUCLEONICA: A Web Portal for the Nuclear Sciences

NUCLEONICA (www.nucleonica.net) is a new nuclear science web portal from the European Commission's Joint Research Centre. The portal provides a customisable, integrated environment and collaboration platform for the nuclear sciences using the latest internet "Web 2.0" technology. NUCLEONICA is aimed at professionals, academics and students working with radionuclides in fields as diverse as the life and earth sciences, and the more traditional disciplines such as nuclear power, health physics and radiation protection, nuclear and radio-chemistry, and astrophysics. It is also used as a knowledge management tool to preserve nuclear knowledge built up over many decades by creating modern web-based versions of so-called "legacy" computer codes [1]. All NUCLEONICA's web applications are browser and operating system independent and can therefore be accessed by most web browsers. The NUCLEONICA portal can also be accessed by a variety of mobile devices.

The NUCLEONICA portal (Fig. 1) consists of four main "Centres": Data Centre, Application Centre, Knowledge Centre, and Networking Centre.

Data Centre: Nuclear data can be accessed through online interactive nuclide charts (based on decay modes, half-lives, binding energy, spin, parity, etc.), reference data (datasheets, derived data, cross sections, spectral data, fission yields, etc.) and searchable databases for internationally evaluated nuclear data. The NUCLEONICA database, which is based on the Joint Evaluated Fission and Fusion (JEFF3.1) radioactive decay datafile, contains decay data on 3896 nuclides in ground and isomeric states. In addition, spectral data with a total of approximately 54000 energies and emission probabilities is available. Additional databases include the 8th Table of Isotopes, prompt gamma neutron activation data, and effective dose coefficients.

Application Centre: NUCLEONICA applications are designed to be very user friendly, intuitive, and require a minimum of learning time. These powerful applications, which form the "backbone" of the nuclear science portal, can be used by professionals and students for everyday calculations. For advanced users, who prefer a more "hands-on" approach, NUCLEONICA provides this with its advanced scripting interface which gives the user a powerful programming interface. The application modules include radioactive decay,

dosimetry & shielding, fission yields, transport and packaging, library creation for spectroscopy, nuclide mixtures, webGraphics. Recently added applications include a Range and Stopping Power module for charged particle interaction with matter (collaboration with Ondokuz Mayıs University) and a Radiological Dispersion module for collective dose estimates following a radiological dispersion event (restricted access).

Through a collaboration between the Karlsruhe Research Centre and the Institute for Transuranium Elements, a web-based version of KORIGEN called webKORIGEN [2] has been developed for use in NUCLEONICA. KORIGEN originates from the ORNL ORIGIN code and has been developed over many years both in the US and in Europe for fuel depletion calculations during irradiation and decay in nuclear reactors. For users, webKORIGEN overcomes the necessity of installation, input preparation and processing, compilation and debugging by offering an intuitive user-friendly web-based application. With webKORIGEN, the user can concentrate on science rather than on the technicalities of large Fortran computer codes. WebKORIGEN is the first web-based version of such a legacy computer code. WebKORIGEN supports calculations for a set of standardized problems, trimmed to three major classes of nuclear plants: the thermal power plants deployed worldwide as Pressurized Water Reactors (PWR) and Boiling Water Reactors (BWR) and a future extension to the current industrial technology: the European Fast Reactor (EFR).

The *Knowledge Centre*, or NucleonicaWiki, is the content management system (CMS) used for NUCLEONICA documentation. It is based on the same "engine" as used in Wikipedia [3]. The NucleonicaWiki is used for online Help, ReadingRoom (for articles, and presentations), weblinks, element information, ask an expert Q & A. The NucleonicaWiki is also used for training course organisation. All training course announcements, agendas, full presentations, exercises, case studies, photo galleries etc., are available online in the NucleonicaWiki [4]. NUCLEONICA training courses introduce the basic concepts of nuclear science and technology and are suitable for participants from the nuclear industry, nuclear research organizations, universities, regulatory authorities etc. Lectures are followed by "hands-on" case studies on the use of the NUCLEONICA web-based applications.

The *Networking Centre* allows users to stay in contact with colleagues from workshops or conferences, meet scientists from similar areas of interest and build up an international contact list. The users can represent themselves (personal home page) and their Institute/Organisation in the international science community. The nuclear news aggregation service provides latest news and information on nuclear issues - the JRC's web crawlers scan hundreds of newspapers every few minutes.

With NUCLEONICA, there is no need to install software - all data and software is server-based. The development team takes care of maintaining the datasets and software and can add user options in response to customer demand. Further Information on registration is available on the NucleonicaWiki [5].

In conclusion, with Nucleonica, users can

- be informed on latest news on nuclear issues
- use internationally evaluated data in daily work
- have access to wide range of nuclear applications
- manage all data in a single browser system
- keep track of your recent activities
- prepare a lecture with Nucleonica materials

- prepare publication quality scientific graphs
- stay in contact with your colleagues
- meet scientists from your areas of interest
- represent yourself and your Institute/Organisation in the international science community

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References

- [1] J. Magill et al., Nucleonica: A Nuclear Science Portal, ENS News, Issue No.17 Summer (July 2007), see www.euronuclear.org/e-news/e-news-17/nucleonica.htm
- [2] webKORIGEN; see <http://www.nucleonica.net:81/wiki/index.php/Help:WebKORIGEN>
- [3] NucleonicaWiki: see www.nucleonica.net:81/wiki/index.php/Special:Allpages/Help:uncements
- [4] Nucleonica Training Courses, see www.nucleonica.net:81/wiki/index.php/Help:Training_Course_Anno
- [5] Register as a Nucleonica user, see: http://www.nucleonica.net:81/wiki/index.php/Help:Register_as_a_Nucleonica_User

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The image displays the NUCLEONICA nuclear science portal, which is organized into four main functional areas, each represented by a distinct color-coded box:

- Data centre... (Blue):** This section features a "Nuclear Data Retrieval" interface with various search filters and a large, colorful 3D visualization of nuclear data trends.
- Applications centre... (Green):** This area includes a "Decay Engine" for calculating decay chains and a "Dosimetry and Shielding" module with a diagram of a radiation source and detector setup.
- Knowledge centre... (Red):** This section provides a "Reading Room Gallery of Nuclear Science" with a grid of articles and a "webKORIGEN" interface for calculating nuclear reaction rates.
- Networking centre... (Yellow):** This area serves as a hub for community interaction, featuring a "Nucleonica Wiki" and a "Nucleonica Forum" for discussions and announcements.

Fig. 1: The NUCLEONICA nuclear science portal showing the four main "Centres" for Data, Applications, Knowledge, and Networking.

ACTIONS